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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/758,172

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Rogier H.M. Groeneveld

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EXAMINER

SOUW, BERNARD E

ART UNIT

PAPER NUMBER

2881

DATE MAILED: 11/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/758,172

Applicant(s)

GROENEVELD ET AL.

Examiner

Bernard E Souw

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 January 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 January 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Europe on 01/14/2000. It is noted, however, that the copy provided by applicant is not **certified** by the corresponding authority as required by 35 U.S.C. 119(b). A certified copy is required before a patent is granted.

Preliminary Amendment

2. The Preliminary Amendment filed 04/16/01, Paper #3, has been entered-in-part. All the amendments to the claims, and parts of the amendments to the specification, have been entered. However:

(a) Regarding the insertions to be made on page 5, -- Summary of the Invention --, and on page 9, -- Brief Description of the Drawings -- and -- Detailed Description of the Invention --, the line-numbers are wrong. Applicant is required to submit a new amendment in order the wrongly made insertions can be corrected.

(b) Regarding amendments to be made on pages 3, 5, 10 and 16, the original wordings cannot be found. Consequently, these amendments have not been entered.

Appropriate corrections are required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishi (USPAT 5,003,342), hereafter to be addressed as Nishi-342.

4. Regarding claim 1, Nishi-342 discloses a lithographic projection apparatus comprising:

(a) an illumination system 2-4-5 shown in Fig.1 and Fig.3 for supplying a projection beam of radiation, as recited in Col.4/ll.35-45;

(b) a first object table 6 for holding a projection beam patterning structure R capable of patterning the projection beam according to a desired pattern, as recited in Col.4/ll.45-50;

(c) a second object table 9 for holding a substrate W (shown in Fig.1, recited in Col.4/ll.50-56) having a surface to be exposed, such that, when held on the table 9, the surface lies in a reference plane, i.e., on the same level as the diffraction grating 15, as recited in Col.5/ll.42-45;

(d) a projection system 7, which images the patterned beam onto a target portion of the substrate W, as recited in Col.4/ll.50-55;

(e) a positioning system 10 shown in Fig.1 which moves the second object table 9 between an exposure position shown in Fig.1 (on-axis), at which the projection system can image the patterned beam onto the substrate W, and a measurement position

shown in Fig.3 (off-axis), as recited in Col.4/II.56-60, Col.5/II.67-68 & Col.6/II.7, and Col.6/II.23-35;

(f) a calibration system around 12 shown in Fig.1 or 13 shown in Fig.3, which is an interferometer system to measure lateral displacement of a reference point in a plane of the object table 9 as a function of tilt, at the measurement position, as recited in Col.4/II.61-68 and Col.8/II.10-30, wherein the calibration system around 12 in Fig.1 or 13 in Fig.3 comprises:

(g) a diffraction grating 15 mounted to the second object table 9, as shown in Fig.1 and Fig.3 and recited in Col.5/II.40-50;

(h) an illuminator not shown in Fig.3 (to the left of light guide 21), which generates a measurement beam of radiation and directs the measurement beam through a reflector system 22-23 to be incident on the diffraction grating 15, so as to be diffracted thereby, as recited in Col.5/II.52-56; and

(i) a detector 19 which detects the position of the diffraction grating 15, as recited in Col.5/59-66.

5. Regarding claim 2, Nishi's diffraction grating 15 is transmissive, as disclosed in Col.5/II.45-56, and Nishi's calibration system around 12 (Fig.1) or 13 (Fig.3) further comprises a light guide 21, as recited in Col.5/II.53-56, which directs the measurement beam to be incident on the diffraction grating 15, as recited in Col.5/II.45-51, in a direction substantially independent of the tilt of the second object table 9, as is inherent and/or implicated in Col.6/II.23-35, i.e., with the system 21-22-23 detached from table 9.

6. Regarding claim 3, Nishi's calibration system around 12 (Fig.1) or 13 (Fig.3) is constructed and arranged to measure displacements of a reference point in the reference plane 9, as is inherent and conventional for an interferometer system, and the diffraction grating 15 is mounted parallel to the reference plane of the object table 9, as disclosed in Col.5/ll.40-45.

7. Regarding claim 13, Nishi's calibration system comprises a plurality of calibration systems, one around 12 (Fig.1) or 13 (Fig.3), another around 18 (Fig.1), as disclosed in Col.6/ll.23-68 & Col.7/ll.1-20, for measuring displacements of the second object table 9 with tilt (expressly recited in Col.8/ll.10-14) about a plurality of axes (X and Y axes), as disclosed in Col.6/ll.23-35 & 59-68, Col.7/ll.1-68, Col.8/ll.10-68 and Col.9/ll.1-65.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 4-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi-342.

10. Nishi-342 recites all the limitations of claim 4, as previously applied to claim 2, except the recitation that the light guide system 21-22-23 comprises a *plurality of reflectors* and is *positioned to reflect the measurement beam onto a return path parallel to the incident path and passing through the diffraction grating in a direction opposite to the incident path*.

Although Nishi's light guide system as depicted in Fig.3 comprises only one reflector element 23, a design comprising a *plurality of reflectors* having equal functions and capabilities as Nishi's system 21-22-23 is within skill in the art. Being a mere matter of design choice, this part of the claim limitation is not patentable.

It would have been obvious to one of ordinary skill in the art to design a light guide system comprising a *plurality of reflectors* depending on the geometry of the arrangement and the available space.

The further limitation regarding the parallelity of the incident and return paths is again a mere matter of design choice without any impact on the function and capabilities of the device, rendering the entire claim 4 unpatentable.

11. Regarding claim 5, the limitation that the plurality of reflectors recited in claim 4 comprises a transparent body having three mutually perpendicular faces at which the measurement beam undergoes reflection, is again a mere matter of design choice without any impact on the function and capabilities of the device, and hence, unpatentable. Furthermore, such a device is conventional and generally known in the art as *retro-reflector*. This Official Notice is supported by Nishi (USPAT 6,331,885), as

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disclosed in Col.49/II.65-67 and Col.50/II.1-41, shown by numerals 31Y1, 31Y2 and 31Y3 in Fig.4. Further support is provided by Dirksen et al. (USPAT 5,917,604), showing in Fig.1 a retro-reflector used for a similar purpose, as recited in Col.11/II.24-27.

12. Regarding claim 6, the limitation that the illuminator is arranged to emit the measurement beam substantially perpendicular to the diffraction grating is conventional, while being also inherent and tacitly understood in Nishi's, whereas the limitation that the light guide comprises a retro-reflector mounted to the second object table behind the diffraction grating to reflect the measurement beam along a return path parallel to the incident path is a mere matter of design choice that has been previously rejected in reference to claims 4 and 5.

13. Regarding claim 7, the limitation that the retro-reflector comprises a plane reflector and a condensing lens, is conventional and well known in the art, while being also a mere matter of design choice that does not have any impact to the function and capability of the device.

14. Regarding claim 8, the limitation that the retro-reflector comprises a solid body having a front surface curved to form a condensing lens and a plane rear surface partly reflective to form the plane reflector of claim 7, is also conventional and well known in

the art, while being also a mere matter of design choice that does not have any impact to the function and capability of the device.

15. Regarding claim 9, the limitation that the plane reflector of claim 7, while being part of a retro-reflector, is positioned so as to reflect only the zeroth order of diffraction (referring to the measurement beam incident onto the transmissive diffraction grating), is again a mere matter of design choice aimed at optimizing the performance tilt measuring system, in order to have clean diffracted beamlets originating from a single incident angle perpendicular to the diffraction grating surface. Note, Applicant's recitation of a "*zeroth order of diffraction*" while tacitly *referring to the incident beam*, is difficult to comprehend and in fact also misleading, since an *incident beam should never be related to any order(s) of diffraction*, but only to its incident angle, as generally known in the art.

16. Claim 10 recites limitations that are also aimed at optimizing the performance tilt measuring system, rendering the claim unpatentable, since optimizing a design using conventional means well known in the art involves only routine skill in the art.

17. Regarding claim 11, the limitation of a corner cube as retro-reflector is well known in the art. This Official Notice is supported by Nishi-885 as well as by Dirksen et al., as previously applied to claim 5.

18. Regarding claim 12, the recitation of anti-reflection coating on one surface of the diffraction grating is conventional and well known in the art, and hence, not patentable.

19. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi-342, as applied to claims 1 above, and further in view of Ota (USPAT 5,831,739), Murata (JP-09199573 A) and Yamamoto et al. (USPAT 5,053,628).

► Regarding claim 14, Nishi-342 describes a *method of calibrating* a lithographic projection apparatus, comprising the steps of:

(a) measuring a position of a reference point on a surface of an object table 9 for holding a substrate W having a surface to be exposed, as shown in Fig.1 (on-axis) and Fig.3 (off-axis) as disclosed in Col.6/ll.23-35 & 59-68, Col.7/ll.1-68 and Col.9/ll.1-65, wherein the limitation of "different tilts" is a further generalization or expansion within skill in the art of the Nishi-342's specific recitation in Col.8/ll.10-14;

(b) calculating a distance between the surface of the object table 9 and a rotation-invariant point of the object table, which is well known in the art as the "Abbe arm", as implicated in Col.9/ll.20-52; and

(c) adjusting parameters of an electronic controller 20 included in the positioning system for moving the object table 9 between an exposure (on-axis) position shown in Fig.1 and a measurement (off-axis) position shown in Fig.3, as disclosed in Col.6/ll.23-35 & 59-68, Col.7/ll.1-20, and further in Col.8/ll.9-68 and Col.9/ll.1-20, so that the rotation invariant

point is at a predetermined vertical distance from the reference point of the object table, as implicated in Col.9/II.44-59.

It is to be noted that Nishi-342's calibration method is much more sophisticated than Applicant's, involving the use of 2 interferometers and including steps not claimed in Applicant's invention. However, parts and steps that are not necessary may be simply discarded, and Nishi's method is still capable of performing everything that is claimed by Applicant, thus rendering Applicant's invention readily unpatentable over Nishi-342's.

As known to one ordinarily skilled in the art, all of Applicant's claimed limitations covered by Nishi-342's method are separately, specifically, and additionally, rendered obvious by Murata, as recited in the SOLUTION regarding the explicit measurement of the Abbe error, or Abbe arm, further by Ota, as shown in Fig.3,4 and 5, regarding the step of measuring different tilts by means of diffraction gratings MX_i and MY_i shown in Fig.5, and the measurement of X (& Y) position by the laser interferometers 17 X (& Y) shown in Fig.3, as recited in Col.9/II.59-67 and Col.10-14; the latter being also obvious over Yamamoto et al., as shown in Fig. 1, 9, 13, 14 and 16 with regard to diffraction grating 6, wafer stage 3, and step motor 53, controlled by controller 52, as recited in Col.5/II.30-50 and Col.13/II.38-56.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to eliminate from Nishi-342's invention those elements (and their functions) that are not needed, or not desired, while retaining only the essential steps to practice Applicant's invention, as recited by Murata, Ota and Yamamoto et al., since it

has been held by the Federal Court that "*omission of an element and its function is obvious if the function of the element is not desired*". *Ex parte Wu*, 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989).

► Regarding claim 15, Nishi-342 describes a *method of manufacturing* a device using a lithographic projection apparatus, comprising the steps of:

(a) providing a substrate W to an object table 9, as shown in Fig.1 and Fig.3, wherein the limitations that the substrate W is provided with a radiation-sensitive layer and having a target portions thereof, is trivial, for being conventional in the art and also inherent in Nishi's, as disclosed in Col.4/ll.50-60;

(b) providing a projection beam of radiation using an illumination system1-4 shown in Fig.1 and Fig.3, as recited in Col.4/ll.35-56;

(c) using a projection beam patterning structure R to endow the projection beam with a pattern in its cross section, as recited in Col.4/ll.42-50;

(d) moving the object table 9 to an exposure position shown in Fig.1, as recited in Col.5/ll.67-68 & Col.7/ll.1-22;

(e) projecting the patterned beam of radiation onto the target portions of the substrate W, as disclosed in Col.4/ll.50-53; and

(f) detecting displacements of a reference point of the second object table at various angles of tilt when situated at the measurement position, as is inherent in Nishi's and further rendered obvious by Murata, Ota and Yamamoto et al., as already applied to claim 14 above.

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20. Claim 16 is a Product by Process claim depending on the process claim 15 that has been previously rejected. Claim 16 would have been allowed if claim 15 were allowed, which is here not the case. therefore, claim 16 is rejected by the same reasons and over the same prior arts as previously applied to the parent claim 15.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 703 305 0149. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308 4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

bes
November 15, 2002


BRUCE ANDERSON
PRIMARY EXAMINER